

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

Applicant's or agent's file reference PD020098	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/10802	International filing date (day/month/year) 29.09.2003	Priority date (day/month/year) 11.10.2002
International Patent Classification (IPC) or both national classification and IPC H02M3/28		
Applicant THOMSON LICENSING S.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 15.04.2004	Date of completion of this report 20.01.2005
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized Officer Zettler, K-R Telephone No. +49 89 2399-7554

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 03/10802**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-13 as originally filed

Claims, Numbers

1-20 received on 25.09.2004 with letter of 24.09.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-20
	No: Claims	
Inventive step (IS)	Yes: Claims	1-20
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following document:
D1: EP-A-0 803 966 (THOMSON BRANDT GMBH) 29 October 1997 (1997-10-29)
2. Clarity and interpretation of the claims (Art. 6 PCT)

2.1 Claim 7

The expression "transistor switch (T5) for turning off the voltage of said output (OUT2) of the second driver stage (IC2)" of claim 7 is in contradiction to the explanations given in the description, p. 12, l. 2-14, since the description teaches that the transistor switch (T5) is turned off if the voltage level of the output (OUT2) of the second driver stage (IC2) is low. The latter is assumed in order to proceed with the international preliminary examination report.

2.2 Claim 15

The expression "the control voltage (Us) being used in standby operation in addition for reducing the switching frequency of the second switch-mode power supply unit (II)" attempts to define the invention by a result to be achieved, which is objectionable (PCT International Preliminary Guidelines Chapter III-4.7), since structural features are missing in that expression being part of an apparatus claim.

3. Novelty and inventive step (Article 33(2) and 33(3) PCT)

3.1 Independent apparatus claim 1

Prior art document D1 is regarded as closest prior art. Using as far as possible the wording of independent claim 1, document D1 discloses the following (references in the parenthesis refer to document D1):

A power supply (Fig. 1; abstract) with a first and a second switch-mode power

supply unit (Fig. 1; abstract; claim 1: the first switch-mode power supply unit, comprises the transformer L50, the driving circuit DR, the switching element T85, the oscillator STO and the protective circuit OVP; the second switch-mode power supply unit comprises the transformer L1, the oscillator OSC and the switching element T21), the power supply unit having a normal operation (abstract), in which both switch-mode power supply units are in operation (col. 2, l. 31-35), and a standby operation (col. 3, l. 44-46; col. 6, l. 29-32), in which the first switch-mode power supply unit is switched off (col. 3, l. 44-46; col. 6, l. 29-32) by a control voltage (Fig. 1, 2a, 2b, in conjunction with col. 6, l. 29-47: the voltage at the winding W2 [according to a clerical error, this winding is referred to as W3 in Fig. 1, and W2 in Fig. 2a] can be considered as control voltage, because this voltage signal is able to switch off the main supply unit, i.e. the first switch-mode power supply unit in standby operation).

The subject-matter of independent claim 1 differs from the apparatus of D1 in that

- an optocoupler transmits the control voltage together with a regulating voltage from a secondary side of the power supply to a primary side of the power supply;
- the control voltage is used in standby operation to reduce the switching frequency of the second switch-mode power supply unit.

The subject-matter of the independent claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the claim 1 may be regarded as how to design an alternative power supply, where the energy consumption in the standby operation is reduced in order to obtain high efficiency.

The solution to this problem proposed in the independent claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

In order to reduce the power loss and therefore enhance the efficiency of the power supply in the standby operation, D1 proposes to reduce the input voltage of the standby supply unit, i.e. second switch-mode power supply unit, by a current limiting device, for example a capacitor (see D1, col. 1, l. 33-55). Therefore, the solution for enhancing the efficiency in D1 focuses on the topology of the circuitry (current limiting capacitor), rather than on the adjustment of an operational

parameter (frequency) as defined in the independent claim 1 of the international application. Since both approaches are completely different, the teaching as disclosed in D1 would not prompt the skilled person to proceed as defined in claim 1 of the application.

The subject-matter of the independent claim 1 is therefore inventive (Article 33(3) PCT).

3.2 Independent apparatus claim 15

The preamble of claim 15 is identical to that of claim 1 so that its features are also anticipated by the prior art document D1.

Therefore, the subject-matter of independent claim 15 differs from the apparatus of D1 in that

- the control voltage is used in the standby operation to reduce the switching frequency of the second switch-mode power supply unit.

The subject-matter of the independent claim 15 is therefore new (Article 33(2) PCT).

From the special technical features of claim 15, the same problem as for claim 1 can be construed. In consequence, claim 15 is inventive (Article 33(3) PCT).

3.3 Independent method claim 11

Since claim 11 is a method claim corresponding to the apparatus claim 15, claim 11 is new and inventive according to Article 33(2) and 33(3) PCT.

3.4 Dependent claims 2 to 10, 12 to 14 and 16 to 20

Since claims 2 to 10 are dependent on claim 1, claims 12 to 14 are dependent on claim 11, and claims 16 to 20 are dependent on claim 15, they as such also meet the requirements of the PCT with respect to novelty and inventive step.

4. Industrial applicability (Article 33(4) PCT)

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The industrial applicability in the sense of Art. 33(4) PCT is given for the claims 1 to 20.

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New claims 1 - 20

(Shall replace all present claims)

1. A power supply with a first and a second switch-mode
5 power supply unit (I, II), the power supply having a
normal operation, in which both switch-mode power supply
units (I, II) are in operation, and a standby operation,
in which the first switch-mode power supply unit (I) is
switched off by a control voltage (Us), **characterized in**
10 **that**

the power supply comprises an optocoupler (OK1)
for transmitting the control voltage (Us) together with
a regulating voltage (Url) from a secondary side of the
power supply to a primary side of the power supply, and
15 the control voltage (Us) is used in standby operation
for reducing the switching frequency of the second
switch-mode power supply unit (II).

2. The power supply as claimed in claim 1, characterized in
20 that the first switch-mode power supply unit (I)
includes a first driver stage (IC1) with an integrated
circuit, which has a first output (COMP1) having a
higher voltage during the normal operation than during
the standby operation, and in that said first output
25 (COMP1) is connected to an oscillator input (OSC2) of
the second switch-mode power supply unit (II) for
reducing the switching frequency of the second switch-
mode power supply unit (II) in the standby operation.

3. The power supply as claimed in claim 2, characterized in
30 that said first output (COMP1) of the first driver stage
(IC1) is an output of an error amplifier of the
integrated circuit (IC1), and in that said first output
(COMP1) is connected via a resistor (R4) to a capacitor
35 (C2) of an oscillator of a second driver stage (IC2)

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arranged within the second switch-mode power supply unit (II) for reducing the oscillation frequency of said oscillator.

- 5 4. The power supply as claimed in claim 2, characterized in that a second output (OUT1) of the first driver stage (IC1), which drives a switching element (T1) of the first switch-mode power supply unit (I), is coupled via a series circuit, having a current limiting means (C3, R3) and a rectifier means (D3), to the oscillator input (OSC2) of a second driver stage (IC2) of the second switch-mode power supply unit (II) for synchronizing the second switch-mode power supply unit (II).
- 10
- 15 5. The power supply as claimed in claim 4, characterized in that said second output (OUT1) is connected via said series circuit (C3, R3, D3) to a capacitor (C2) of an oscillator of the second switch-mode power supply unit (II).
- 20
6. The power supply as claimed in claim 4 or 5, characterized in that an output (OUT2) of the second driver stage (IC2), which drives a switching element (T2) of the second switch-mode power supply unit (II), is connected by a switching stage (T5, R5, R6) to said series circuit (C3, D3) for increasing a pulse width ratio.
- 25
7. The power supply as claimed in claim 6, characterized in that said switching stage (T5, R5, R6) has a transistor switch (T5) for turning off the voltage of said output (OUT2) of the second driver stage (IC2), which is coupled to a switching transistor (T2) connected downstream, said transistor switch (T5) being at low impedance on the output side if the output voltage of
- 30
- 35

said output (OUT2) of the second driver stage (IC2) is high.

8. The power supply as claimed in claim 6 or 7,
5 characterized in that the switching stage (T5, R5, R6) blocks signals of the series circuit (C3, R3, D3) if the output voltage (OUT2) of the second driver stage (IC2) is high.
- 10 9. The power supply as claimed in one of the preceding claims, characterized in that the first and second switch-mode power supply units (I, II) in each case have a transformer (TR1, TR2) having a primary winding (W1, W2) and at least one secondary winding (W3 - W6), and in
15 that both switch-mode power supply units (I, II) operate according to the flyback converter principle.
10. The power supply as claimed in one of the preceding claims, characterized in that the control voltage (Us)
20 is coupled to a control input (VIN1) of the driver stage (IC1) of the first switch-mode power supply unit (I) and to the oscillator input (OSC2) of the second switch-mode power supply unit (II).
- 25 11. Method for operating a power supply comprising a first and a second switch-mode power supply unit (I, II), the power supply having a normal operation, in which both switch-mode power supply units (I, II) are in operation, and a standby operation, in which the first switch-mode
30 power supply unit (I) is switched off by a control voltage (Us), **characterized by the step**
using the control voltage (Us) in addition for reducing the switching frequency of the second switch-mode power supply unit (II) in standby operation.

12. The method as claimed in claim 11, comprising the step of transmitting the control voltage (Us) via an optocoupler (OK1) together with a regulating voltage (Url) for the first switch-mode power supply unit (I) from a secondary side of the power supply to a primary side of the power supply.
13. The method as claimed in claim 12, comprising the step of coupling the control voltage (Us) and the regulating voltage (Url) to a control input (VIN1) of a driver stage (IC1) of the first switch-mode power supply unit (I).
14. The method as claimed in claim 11, 12 or 13, comprising the step of connecting a first output (COMP1) of the driver stage (IC1) of the first switch-mode power supply unit (I) to an oscillator input (OSC1) of the second switch-mode power supply unit (II) for reducing the switching frequency of the second switch-mode power supply unit (II) in the standby operation.
15. A power supply with a first and a second switch-mode power supply unit (I, II), the power supply having a normal operation, in which both switch-mode power supply units (I, II) are in operation, and a standby operation, in which the first switch-mode power supply unit (I) is switched off by a control voltage (Us), the control voltage (Us) being used in standby operation in addition for reducing the switching frequency of the second switch-mode power supply unit (II).
16. The power supply as claimed in claim 15, characterized in that the control voltage (Us) is transmitted via an optocoupler (OK1) together with a regulating voltage (Url) for the first switch-mode power supply unit (I)

from a secondary side of the power supply to a primary side of the power supply.

17. The power supply as claimed in claim 15 or 16,
5 characterized in that the first switch-mode power supply unit (I) includes a first driver stage (IC1) with an integrated circuit, which has a first output (COMP1) having a higher voltage during the normal operation than during the standby operation, and in that said first
10 output (COMP1) is connected to an oscillator input (OSC1) of the second switch-mode power supply unit (II) for reducing the switching frequency of the second switch-mode power supply unit (II) in the standby operation.

18. The power supply as claimed in claim 17, characterized in that said first output (COMP1) of the first driver stage (IC1) is an output of an error amplifier of the integrated circuit (IC1), and in that said first output
20 (COMP1) is connected via a resistor (R4) to a capacitor (C2) of an oscillator of a second driver stage (IC2) arranged within the second switch-mode power supply unit (II) for reducing the oscillation frequency of said oscillator.

19. The power supply as claimed in one of the preceding claims 15 - 18, characterized in that a second output (OUT1) of the first driver stage (IC1), which drives a
30 switching element (T1) of the first switch-mode power supply unit (I), is coupled via a series circuit, having a current limiting means (C3, R3) and a rectifier means (D3), to an oscillator input (OSC2) of a second driver stage (IC2) of the second switch-mode power supply unit (II) for synchronizing the second switch-mode power
35 supply unit (II).

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- 5 20. The power supply as claimed in one of the preceding claims 15 - 19, characterized in that the control voltage (Us) is coupled to a control input (VIN1) of the first switch-mode power supply unit (I) and to the oscillator input (OSC2) of the second switch-mode power supply unit (II).

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